



Annual Report FY 2023

Steamboat Creek Snorkel Surveys

Prepared by Pacific Rivers

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EXECUTIVE SUMMARY

The Frank and Jeanne Moore Steelhead Sanctuary, established in March 2019, created a 100,000-acre sanctuary for steelhead and for a temperature refuge for not only Steamboat Creek but the North Umpqua River. Snorkel surveys have been conducted in Steamboat leading up to and following the designation of the Sanctuary, spanning 5 years, 2019 – 2023.

The water year of 2023 (October 1 to September 30) was a typical water year from October to January. The largest peak flow of the year occurred in late January. It was a little under 8,000 cfs (cubic feet per second), which is a little less than normal. This is enough flow to get the steelhead into the tributaries, but it is not enough to make it easy for the fish to make it far into the headwaters. After the January storm, there was not a major storm until mid-March, when a storm caused a peak-flow of about 5,000 cfs, followed by a second peak flow of 6,000 cfs in mid-April. As a result of these late-season storms, the summer base-flows were higher than typical years.

Surveys in Fiscal Year 2023 included all of the mainstem of Steamboat Creek except Black Gorge and all the major tributaries except Big Bend Creek, where high flows impaired the crew's ability to conduct surveys. Several minor tributaries including Singe and Reynolds Creeks were not surveyed as we determined in previous years that the majority of fish in them are resident fish, not steelhead.

In 2023, the estimated population of age-0 steelhead was approximately 8,710 age-0 steelhead in the mainstem of Steamboat Creek and 20,749 age-0 steelhead in the major tributaries of Steamboat Creek. The highest estimate of age-0 fish in the mainstem were in the section from Cedar Creek to Little Rock Creek. Over 90% of the age-0 steelhead estimated in the tributaries were in Cedar, Little Rock, and Horse Heaven Creeks.

Age-1 steelhead were distributed throughout the mainstem of Steamboat Creek. It is estimated that there were 2,191 fish in the mainstem. They were widely distributed in the reach from Cedar Creek to Little Rock Creek. The estimated number of age-1 steelhead in the tributaries was 2,043 fish. Over 74% of the age-1 fish in the tributaries were in Little Rock Creek and Cedar Creek.

Age-2 steelhead were primarily observed in the mainstem of Steamboat Creek. The estimated population is 3,482 age-2 fish in the mainstem with 40% of them in the reach from Steelhead to Big Bend Creek. It is estimated that there were 2,082 age-2 steelhead in the tributaries and 70% of them were in Little Rock Creek and Cedar Creeks.

Cutthroat trout are primarily observed in the mainstem of Steamboat Creek. Their population in the mainstem is estimated as 2,369 fish; again, the reach from Steelhead Creek to Big Bend Creek had over 38% of the estimated population. Approximately 60 cutthroat are estimated to be in the tributaries.

The population of age-0 steelhead in the mainstem of Steamboat Creek in 2023 can be considered average for the five sample years based on data from the three reaches of the mainstem that were sampled in all five years. The lowest year estimate of age-0 steelhead was 2022, when a series of storms from March through mid-June likely greatly reduced the survival of the age-0 steelhead emerging from the gravel. The years 2020 and 2021, with more 'typical' flows, had significantly greater number of age-0 steelhead. The highest population estimate for age-0 steelhead in the three mainstem reaches was in 2021, which was a year with a peak flow in January and lacked late spring high flows, aka more 'typical' flows.

There were also three tributary reaches that were sampled in all five years. In the tributaries, a similar pattern to the mainstem was observed for age-0 steelhead. The lowest year was in 2022, with the series of spring storms, while the highest estimate was in 2020- a water year with more typical flows.

For age-1 steelhead, this survey year had the second highest population estimate of fish in the mainstem for the five years of sampling. Interestingly, the year with the highest population estimates in the three main stem reaches was 2022, the year before the lowest number age-0 fish found during the survey. Clearly, the age-1 fish benefited from the higher-than-average summer flows, and apparently were not negatively affected by the spring storms. In the tributaries, age-1 steelhead numbers were average in 2023. The year with the highest population estimates in the tributaries was 2022, the same as the mainstem. It appears that the series of storms in the spring were also a benefit to age-1 steelhead in the tributaries.

Age-2 steelhead are predominantly found in the mainstem of Steamboat rather than in the tributaries. During the current year, the population estimate in the three mainstem reaches and the three tributary reaches was the highest of the five years of sampling. They were not affected by the high flow events.

Cutthroat trout are primarily found in the major pools in the mainstem of Steamboat Creek. The population estimate of the three mainstem reaches in 2023 was the highest calculated population during the five years of sampling. The estimated population for the tributaries was relatively average for the five years of sampling. Cutthroat were apparently also not affected by the high flow events during the spring.

For the six reaches surveyed all 5 years, survival rates of the cohorts from age-0 through age-2 were calculated. Survival of age-0 to age-1 steelhead ranged from .05 to .63, while the survival

from age-1 to age-2 ranged from .14 to .73.

In summary, age-0 steelhead population estimates correlated well with the flow regimes for the five years. In a 'typical' year, characterized by a peak flow in January and each subsequent storm being significantly lower than the peak-flow, spawning tends to be highly successful as does survival of the juveniles. High peak flows after spawning can scour many of the redds. In an atypical year like 2023, high flows late in the spring can reduce the population of juveniles as they come out of the gravel. The other age groups of steelhead and cutthroat are much less affected by the flow regime than are the age-0 fish.

The population of age-0 fish are highly variable from year to year. The number of steelhead in subsequent year classes is not so variable. The population success of the older age classes (age-1, age-2, etc.) are likely to be more limited by habitat, not directly weather patterns as are the age-0 steelhead.

INTRODUCTION

The Frank and Jeanne Moore Steelhead Sanctuary, established in March 2019, created a 100,000 acres sanctuary for steelhead and for a temperature refuge for not only Steamboat Creek but the North Umpqua River, itself. During 2023, a snorkel survey of the mainstem and tributaries was completed by Andrew Dewberry, Bethany Dewberry, Dane Miller, Emma Latendresse, Rhiana Pritchett, Julian Larson, and Charley Dewberry. The survey included all of the mainstem of Steamboat Creek except Black Gorge and all the major tributaries of Steamboat Creek except Big Bend Creek.

The snorkel surveys enable us to construct a snapshot of summer rearing of salmonids in Steamboat Creek. This snapshot of the abundance and distribution of steelhead (the dominant salmonid) in the basin and the evaluation of the stream habitat and landscape processes provides basic information to identify restoration opportunities within the basin. With each additional year of survey, the trends in the population of each salmonid and age class of steelhead become more clear. It also allows us to greater understand the factors affecting the abundance and distribution of the salmonids in the basin.

STUDY AREA

Steamboat Creek is a major tributary of the North Umpqua River basin. The drainage area is approximately 100,000 acres. Steamboat Creek is a strategically important producer of steelhead trout, coho salmon, chinook salmon and cutthroat trout within the North Umpqua drainage.

The Steamboat basin lies entirely within the Western Cascades Ecoregion. The geology is dominated by weathered Tertiary volcanic rocks. The dominant forest community is western Hemlock-Douglas fir.

THE WATER YEAR

The flows were relatable to a typical water year from October to January (*Figure 1*). There were a series of storms, each larger than the previous one, until the largest peak flow of the year occurred in late December. It was a little under 8,000 cfs (cubic feet per second), which is a little less than average. Flows of this magnitude can provide access to the major tributaries for steelhead, but it is not enough to make it easy for the fish to make it far into the headwaters of the tributary streams. After the December storm, there was not a major storm until mid-March, when one generated flows of about 5,000 cfs. This was followed in April by a peak flow of over 6,000 cfs. As a result of these storms, the summer base-flows were higher than normal.

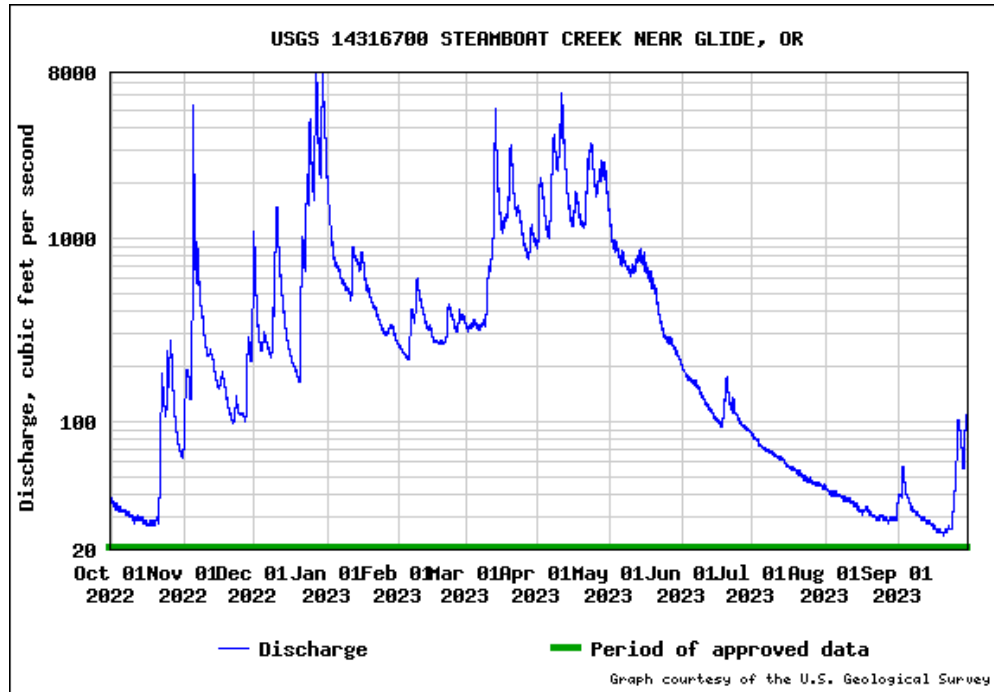


Figure 1: Annual hydrograph for Water Year 2023.

METHODS

The snorkel surveys were conducted using the Hankin-Reeves method (Hankin and Reeves 1990). A dive crew consisting of two or more people work their way upstream through their designated stream reach. The stream channel was divided into three habitat types: riffles, pools, and glides. For each habitat unit, the length and width were estimated. The frequency of the surveyed units was: 1:10 riffles; 1:8 glides; and 1:5 pools. All salmonids were counted in each surveyed stream habitat. In the habitat units that were snorkeled, the length and width of the habitat units were measured. Quality assurance and quality Control checks are conducted at the end of each survey by the survey lead.

For these surveys, age-0 and 1 trout include both steelhead and cutthroat trout. While some individuals are easy to identify into their respective species, others are very difficult. As a result, we elected to combine both species into these age categories. Age-2 steelhead were differentiated from age-2 cutthroat trout. Adult salmonids were observed in the surveys, however, they were not counted.

The population estimate is calculated by first seeing if the correlation between the number of steelhead of a given age and the size of the habitat units for a stream reach are greater than 0.7. It is exceedingly rare for the Steamboat Creek correlations to be greater than 0.7. Since the correlations are less than 0.7, the observed number of fish is multiplied by the frequency of

habitats snorkeled. For example, if 1 in 5 pools are sampled, the total number of steelhead observed in a stream reach is multiplied by five.

RESULTS AND DISCUSSION

Surveyed Reaches

During summer of 2023, the snorkel survey of the basin was completed. All of the mainstem of Steamboat Creek except Black Gorge and all of the major tributaries except Big Bend Creek were surveyed. (See Figure 2 and Appendix Figure B-1).

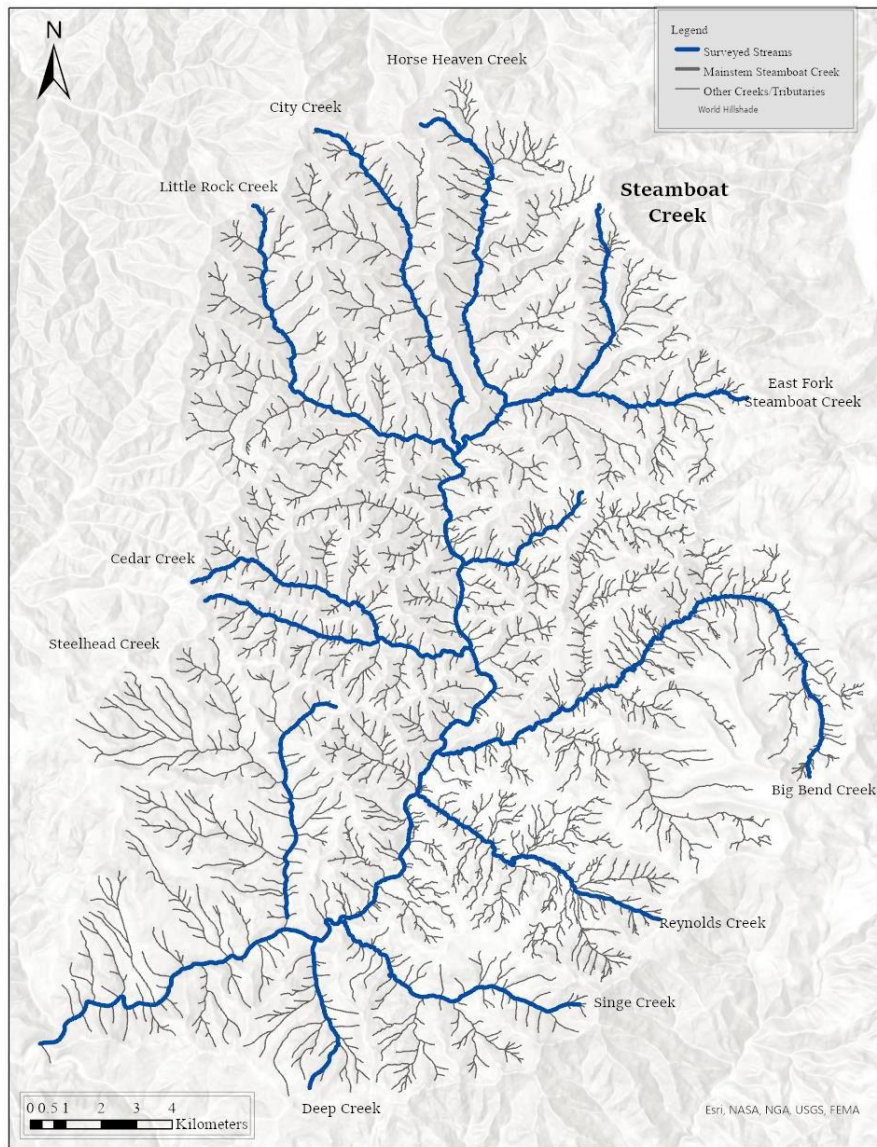


Figure 2: Surveyed tributaries in the Steamboat Creek watershed. Note the full reach of each tributary may not have been surveyed, only those reaches that an adult salmonid could have access to.

Analysis of Steelhead Populations by Age

Age-0 Steelhead

In 2023, the entirety of mainstem of Steamboat Creek was surveyed resulting in estimates of about 8,710 age-0 steelhead in the mainstem of Steamboat Creek and 20,749 age-0 steelhead in the major tributaries of Steamboat Creek (Table 1). The highest estimate of age-0 fish in the mainstem occurred in the reach from Cedar Creek to Little Rock Creek. The population estimates of age-0 steelhead in the tributaries were above average of our long-term estimates (Table 2) and over 90% of the age-0 steelhead estimated in the tributaries that were recorded in Cedar, Little Rock, and Horse Heaven Creeks.

Table 1: Salmonid population estimates from section of the mainstem Steamboat Creek and tributaries 2023.

Stream Reach				
Mainstem:	STHD-0	STHD-1	STHD-2	CUT
Mouth- Little Falls	11	10	120	1,080
Little Falls to Steelhead				
Steelhead- Big Bend	2,279	514	1,399	902
Big Bend-Cedar	1,075	239	675	114
Cedar- Little Rock	3,642	918	590	210
Little Rock- Horse Heaven	639	352	540	57
H.H. - Headwaters	1,064	158	158	6
	8,710	2,191	3,482	2,369
Tributaries	STHD-0	STHD-1	STHD-2	CUT
Buster	289	86	11	11
Cedar	5,824	906	722	11
East	259	6	41	6
City Creek	94	12	12	
Horse Heaven Creek	4,632	245	393	14
Little Rock Creek	8,266	611	744	9
Steelhead Creek	1,385	177	159	9
	20,749	2,043	2,082	60

Table 2: Age-0 salmonid population estimates from sections of the mainstem Steamboat Creek and tributaries 2019- 2023.

Stream Reach					
Mainstem:	2019	2020	2021	2022	2023
Mouth- Little Falls	60			294	11
Steelhead to Singe	134				
Little Falls to Steelhead				498	
Steelhead to Big Bend		9,508		2,203	2,279
Big Bend to Cedar	179	2,555		1,620	1075
Cedar- Little Rock	760	8,897	8,433	1,450	3,642
Little Rock- Horse Heaven	1,896	4921	9001	900	639
H.H. - Headwaters	240	4549	2,950	481	1,064

Tributaries	2019	2020	2021	2022	2023
Big Bend Creek	362	2,843			
Buster		185	206	21	289
Cedar	2,864	2410		2,581	5,824
City Creek	1,278	1,919	6,498	171	94
E. Fork Steamboat	26	572	374		259
Horse Heaven Creek	1,281	5771	5,503	231	4,632
Little Rock Creek	3,968	1,4685	9,915	399	8266

Reynolds	639	198			
Singe Creek	171	156			
Steelhead Creek	921	525		127	1,385
E. Fork Headwaters	19				

The population estimate of age-0 steelhead in the mainstem of Steamboat Creek in 2023 can be considered relatively average for the five sample years using the three mainstem reaches and the three tributary reaches that were sampled in all five years. (Tables 1-9). The lowest population estimates of age-0 Steelhead occurred in 2022, when a series of storms from March through mid-June, likely greatly reduced the survival of the age-0 steelhead emerging from the gravel. The middle two years (2020, 2021) had more 'typical' flows, without large flushing flows in late spring, and a significantly greater number of age-0 steelhead than did 2019 or 2022. The highest estimated population of age-0 steelhead in the three mainstem reaches was in 2021.

Three tributary reaches were also surveyed all five years: Little Rock, City, and Horse Heaven Creeks. A similar pattern as the mainstem is observed for age-0 steelhead. The lowest estimated population was observed in 2022, while the highest estimate was in 2020. Again, likely contributable to flows.

Age-1 Steelhead

Age-1 steelhead are generally distributed throughout the mainstem of Steamboat Creek. The population estimate estimated that there were 2,191 fish in the mainstem in 2023 (Table 3). This is the second highest year for the three reaches which were surveyed in all five years. Age-1 steelhead were widely distributed and the reach from Cedar Creek to Little Rock Creek had the highest number, which comprised 42% of the fish in the mainstem. Interestingly, the year with the highest number of age-1 steelhead in the mainstem reaches was 2022, which had the lowest number of age-0 steelhead the previous year. The age-1 fish benefited from the higher-than-average summer flows and were large enough not to be as negatively affected by the high spring flows as the age-0 steelhead. Observations were similar for the tributaries.

Table 3: Age-1 salmonid population estimates from sections of the mainstem Steamboat Creek and tributaries 2019- 2023.

Stream Reach					
Mainstem:	2019	2020	2021	2022	2023
Mouth- Little Falls	117			143	10
Little Falls to Steelhead				1119	
Steelhead to Big Bend		163		1919	514
Big Bend to Cedar	132	131		424	239
Cedar- Little Rock	91	284	380	1187	918
Little Rock- Horse Heaven	336	151	277	466	352
H.H. - Headwaters	183	203	238	251	158

Tributaries	2019	2020	2021	2022	2023
Big Bend Creek	114	308			
Buster		19	8	36	86
Cedar	893	135		198	906
City Creek	125	282	244	396	12
E. Fork Steamboat	12	6	42		6
Horse Heaven Creek	116	243	377	108	245
Little Rock Creek	166	312	530	930	611

Reynolds	241	142			
Singe Creek	85	87			
Steelhead Creek	363	215		158	177
E. Fork Headwaters	13				

The estimated number of age-1 steelhead in the tributaries was 2,043 fish. Over 40% of the age-1 fish in the tributaries were in Little Rock Creek. The population observed in 2023 can be considered average according to surveys from previous years.

Age-2 Steelhead

Age-2 steelhead were primarily observed in the mainstem of Steamboat Creek in 2023 (Table 4). The age-2 steelhead population is estimated at 3,482 in the mainstem; with 40% of them in the reach between Steelhead and Big Bend Creek. The population of age-2 steelhead in the tributaries is estimated to be 2,082 fish; and 70% of them were observed in Little Rock Creek and Cedar Creek. Both in the tributaries and in the mainstem, age-2 steelhead had the highest estimates of the five years of survey.

Table 4: Age-2 salmonid population estimates from sections of the mainstem Steamboat Creek and tributaries 2019- 2022.

Stream Reach					
Mainstem:	2019	2020	2021	2022	2023
Mouth to Little Falls	177			279	120
Little Falls to Steelhead				373	
Steelhead to Big Bend		341		998	1399
Big Bend to Cedar	44	11		343	675
Cedar- Little Rock	8	105	38	428	590
Little Rock- Horse Heaven	58	174	6	127	540
H.H. - Headwaters	0	16	16	56	158

Tributaries	2019	2020	2021	2022	2023
Big Bend Creek	164	45			
Buster		5	0	0	11
Cedar	115	118		80	722
City Creek	15	35	40	100	12
E. Fork Steamboat	0	0	11		41
Horse Heaven Creek	24	76	17	5	393
Little Rock Creek	24	12	84	246	744
Reynolds	47	16			
Singe Creek	76	21			
Steelhead Creek	64	63		138	159

Cutthroat Trout

Cutthroat trout are primarily observed in the mainstem of Steamboat Creek. The population in the mainstem in 2023 is estimated to be 2,369 fish; again the reach from Steelhead Creek to Big Bend Creek had 38% of the estimated population in the mainstem (Table 5). Of the 5 years of survey in the three reaches that were sampled each year, the highest estimated population was observed this year in 2023. This trend follows closely to that of age-2 steelhead in the mainstem. The estimated population is 60 cutthroat trout in the tributaries.

Table 5: Cutthroat trout population estimates from sections of the Mainstem Steamboat Creek and tributaries 2019- 2023.

Stream Reach					
Mainstem:	2019	2020	2021	2022	2023
Mouth to Little Falls	20			114	1,080
Little Falls to Steelhead				104	
Steelhead to Big Bend		147		503	902
Big Bend to Cedar	26	151		65	114
Cedar- Little Rock	16	133	40	144	210
Little Rock- Horse Heaven	9	39	11	20	57
H.H. - Headwaters	28	32	0	33	6

Tributaries	2019	2020	2021	2022	2023
Big Bend Creek	38	53			
Buster		5	0	10	11
Cedar	98	10		0	11
City Creek	5	0	6	6	0
E. Fork Steamboat	34	22	0		6
Horse Heaven Creek	10	26	9	5	14
Little Rock Creek	49	12	5	9	9
Reynolds	47	0			
Singe Creek	19	5			
Steelhead Creek	33	5		10	9
E. Fork Headwaters	0				

LIFE HISTORY ANALYSIS

A life history analysis is a powerful way to analyze populations. Five years is the minimum time to gather enough information to begin it. Basically, you follow a cohort through each year. The information is collated in Table 6 for the three mainstem reaches and the three tributary reaches that were sampled in all five years, (i.e., mainstem: Cedar Creek to the Headwaters; Tributaries: Cedar, Little Rock, and Horse Heaven Creeks). The range of survival across all cohorts was from .05 to .63. The highest population estimate for age-2 steelhead was observed this year (2023). This cohort started out in 2021 as age-0 steelhead (n=42,300). They benefited from having the largest population estimate of any of the five years in 2021. However, their survival to age-1 was only 8% (n=3,338). However, their survival from age-1 to age-2 was .73 (n=2,437), which was the highest rate for that age.

Table 6: Life History Analysis of the Steelhead from Steamboat Creek 2019-2023.

	2019 Cohort	Survival (S)% 2019 Cohort	2020 Cohort	S % 2020 Cohort	2021 Cohort	S % 2021 Cohort	2022 Cohort	S % 2022 Cohort	2023 Cohort
Age-0	9,423		40,742		42,300		3,632		18,337
		16		5		8		63	
Age-1	1,475		2,046		3,338		2,296		
		14		47		73			
Age-2	201		962		2,437				

It is also interesting to compare the cohorts from 2020 which those of 2021. In 2020, there were about 40,000 age-0 steelhead in the six reaches of stream. The next year these same reaches had an estimated population of 2,046 age-1 fish. This is a survival rate of .05. Compare this with 2022.

In 2022 there were 3,632 age-0 steelhead in the six stream reaches. This year there were 2,296 age 1 fish in those reaches. This is a survival rate of .63. There were more age-1 steelhead in the 2022 cohort than in the 2021 cohort. The 2021 cohort had 40,000 age-0 steelhead in it while the 2022 cohort only had 3,632 age-0 fish in the cohort.

A life-history analysis assumes that there is no migration in or out of the reaches. This assumption is clearly not met in the Steamboat basin, so such an analysis has to be taken lightly. But the relative survival rates are an important metric for evaluating the site and the water year.

SUMMARY

During the current year, we were able to complete the survey of the entire mainstem of Steamboat Creek except Black Gorge and all of the major tributaries except Big Bend Creek.

The population estimate for age-0 steelhead was relatively average during the current year, likely because of the series of storms from April through mid-June. Age-1 and age-2 steelhead and cutthroat all had population estimates that were above average. Age-2 steelhead and cutthroat had the highest estimates in this year of the five years of survey. The older salmonids were probably less impacted by the series of storms than the age-0 fish. They also benefited from higher-than-average summer flows.

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APPENDICES

APPENDIX A

SUPPLEMENTAL DATA SUMMARIES 2002 - 2019

Table A-1. Snorkel survey results Steamboat Creek and Tributaries, 2004 to 2019.

Year	Reach	Sthd 0	Sthd 1+	Sthd 2+	Centrarchids
2002**	lower	139	24		
June 3 2004	lower	119	27*		108
June 4/2005	lower	577	49	23	101
June 3/2006	lower	183	110	27	0
June 2/ 2007	lower	223	25	17	25
June 7-8/ 2008	lower	393	8	15	0
Jun-08	Upper	601	87	23	
Jun-08	Right Fork	234	8	1	
Jun-08	Left Fork	75	8	5	
<i>2008 total</i>		<i>1303</i>	<i>111</i>	<i>44</i>	
June 2009	lower	116	12	11	0
June 2009	upper	210	105	19	
June 2009	right fork	4	4	0	
June 2009	left fork	0	26	0	
<i>2009 total</i>		<i>330</i>	<i>147</i>	<i>30</i>	
June 2010	lower	152	44	74	
June 2010	upper	207	9	4	
June 2010	right fork	43	4	4	
June 2010	left fork	8	0	4	
<i>2010 totals</i>		<i>410</i>	<i>57</i>	<i>86</i>	
June 2011	lower	15	146	69	
June 2011	upper	244	245	95	
June 2011	RF	42	12	0	
June 2011	LF	16	8	6	
<i>2011 totals</i>		<i>317</i>	<i>411</i>	<i>170</i>	
June 2012	lower	93	90	95	
June 2012	upper	66	39	18	
June 2012	RF	8	12	0	
June 2012	LF	0	4	4	
<i>2012 Totals</i>		<i>167</i>	<i>145</i>	<i>117</i>	
June 2013	lower	30	13	13	
June 2013	upper	173	38	0	
June 2013	RF	11	11	11	

June 2013	LF	0	15	0
<i>2013 Totals</i>		<i>214</i>	<i>77</i>	<i>24</i>
June 2014	lower	197	32	16
June 2014	upper	320	61	22
June 2014	RF	87	26	0
June 2014	LF	0	0	8
<i>2014 Totals</i>		<i>604</i>	<i>119</i>	<i>46</i>
June 2015	lower	22	18	32
June 2015	upper	272	29	17
June 2015	RF	27	15	20
June 2015	LF	0	0	0
<i>2015 Totals</i>		<i>321</i>	<i>62</i>	<i>69</i>
June 2016	lower	53	42	2
June 2016	upper	93	60	37
June 2016	RF	94	5	3
June 2016	LF	0	0	0
<i>2016 Totals</i>		<i>240</i>	<i>107</i>	<i>42</i>
June 2017	lower	9	26	0
June 2017	upper	399	142	16
June 2017	RF	21	0	0
June 2017	LF	0	0	0
<i>2017 Totals</i>		<i>429</i>	<i>168</i>	<i>16</i>
June 2018	lower	0	9	30
June 2018	upper	78	102	28
June 2018	right	28	15	2
Jun-18	left	0	0	0
<i>2018 Totals</i>		<i>106</i>	<i>126</i>	<i>60</i>
June 2019	lower	18	4	4
June 2019	upper	275	77	23
June 2019	right	134	9	0
June 2019	left	7	0	1
<i>2019 totals</i>		<i>434</i>	<i>90</i>	<i>28</i>

* Includes Sthd 1+ and Sthd 2+

** Number of steelhead trout calculated from electrofishing efforts

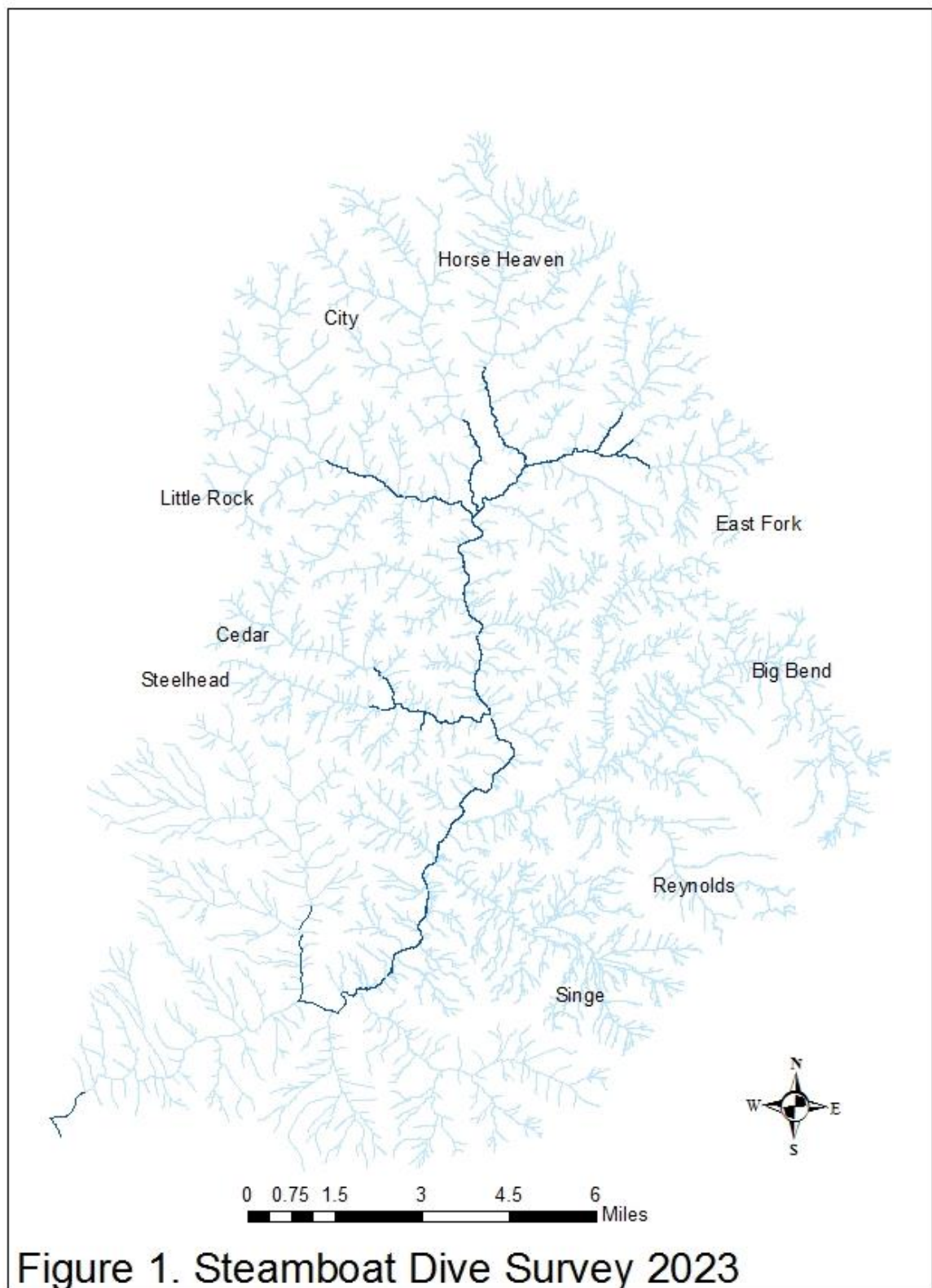
Table A-2. Total number of Salmonids in Steamboat Creek Basin 2020				
Unit	Steelhead Age-0	Steelhead Age-1	Steelhead Age-2	Cutthroat
Mainstem:				
Mouth-ST	10148	1633	1461	274
ST-Rey	7420	727	320	88
Rey- BB	2088	32	21	59
BB-Cedar	2555	131	11	151
Ced-LR	8897	284	105	133
LR-HH	4921	151	174	39
H. Heaven	4549	203	16	32
Tributaries:				
Big Bend	2843	308	45	53
Buster	185	19	5	5
Cedar	2410	135	118	10
City	1919	282	35	0
E. Fork	572	6	0	22
H Heaven	5771	243	76	26
Little Rock	14685	312	12	12
Reynolds	198	142	16	0
Singe	156	87	21	5
Steelhead	525	215	63	5
<i>Totals</i>	69,842	4,910	2,499	914

Table A-3. Total number of Salmonids in Steamboat Creek Basin 2021				
Unit	Steelhead Age-0	Steelhead Age-1	Steelhead Age-2	Cutthroat
Mainstem:				
Mouth-ST				
ST-Rey				
Rey- BB				
BB-Cedar				
Ced-LR	8433	380	38	40
LR-HH	9001	277	6	11
H. Heaven	2950	238	16	
Tributaries:				
Big Bend				
Buster	206	8	0	0
Cedar				
City	6498	244	40	6
E. Fork	374	42	11	0
H Heaven	5503	377	17	9
Little Rock	9915	530	84	5
Reynolds				
Singe				
Steelhead				
<i>Totals</i>	42,880	2,096	212	71

Table A-4. Salmonid population estimates from section of the mainstem Steamboat Creek and tributaries 2022.

	Steelhead Age-0	Steelhead Age-1	Steelhead Age-2	Cutthroat
Mainstem:				
Mouth-ST	294	143	279	114
ST-Rey	720	1,119	373	104
Rey- BB	2,203	1919	998	503
BB-Cedar	1,620	424	343	65
Ced-LR	1,450	1,187	428	144
LR-HH	900	466	127	20
H. Heaven	481	251	56	33
<i>Totals</i>	7,668	5,509	2,604	983
Tributaries:				
Big Bend				
Buster	21	36		10
Cedar	2,581	198	80	0
City Creek	171	396	100	6
H Heaven	231	108	5	5
Little Rock	399	930	246	9
Steelhead	127	158	138	10
<i>Totals</i>	3,530	1,826	569	40
TOTAL	11,198	7,335	3,173	1,023

APPENDIX B - Surveyed Reaches 2023



APPENDIX C - Hydrographs for Study Years

